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Towards large and remote protected areas in the South Atlantic Ocean: St. Peter and St. Paul´s Archipelago and the Vitória-Trindade Seamount Chain

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ABSTRACT

Large (> 10,000 km^2) marine protected areas (LMPAs) have recently been established around the planet in pursuit of international conservation and geopolitical goals. A recent such initiative in the South Atlantic has important social and ecological implications that have not been discussed in existing literature. In light of this knowledge gap, this article aims to discuss the implementation of MPA networks in the St. Peter and St. Paul´s archipelago and the Vitória-Trindade seamount chain (~1000 km from the Brazilian coast). The participatory process conducted by the Brazilian Federal government created LMPAs networks that integrate multiple-use zones centered on certain natural monuments (islands) and spanning a radius of 200 nautical miles around these islands. With these LMPAs (together covering ~920,000 km^2), Brazil increases its MPA coverage from 1.5% to ~ 25% of its EEZ (Exclusive Economic Zone). However, even with this high percentage of protection, many important coastal ecosystems are not yet protected in Brazilian waters. These LMPAs can be an important step towards the conservation of biodiversity and ecosystem services of terrestrial insular, shallow, mesophotic, and deep-sea ecosystems. Owing to this importance, it is necessary to ensure adequate surveillance, participative governance, as well as an adequate management plan to deal with the increase in human pressures (fishing, mining, plastics, and climate-change stressors). This paper discusses strategies for the establishment of ocean zoning (including no-take zones) and large-scale marine spatial planning to improve management effectiveness. It also provides insights into the challenges faced in the management of LMPAs in a changing ocean.

Marine Protected Areas (MPAs) are promoted as ocean conservation tools that can mitigate human pressures and build resilience when designed and managed well [1]. The percentage of the world´s oceans that are protected has increased steadily in recent years, primarily due to large MPAs (LMPAs) [2]. These LMPAs (> 10,000 km^2) are increasingly being established to meet global conservation targets, promote sustainable use of ocean resources [3], and meet geopolitical goals [4].

The debate over the social and ecological effectiveness of LMPAs has grown considerably over the last few years [2]. The management of LMPAs in remote areas is a challenge for the multiple stakeholders involved in ocean governance [5,6]. However, there is a limited research into these challenges. A recent such initiative in the South Atlantic Ocean has important social and ecological implications that have not been discussed in existing literature. Most Brazilian MPAs in the South Atlantic are of small to medium scale (< 10,000 km^2) and protect generally coastal environments [7,8].

In light of this knowledge gap, this article discusses the newest and remote LMPAs in the South Atlantic Ocean: the St. Peter and St. Paul archipelago (SPSPA), halfway between South America and Africa, and the Vitória-Trindade chain (VTC), ~1000 km from the coast. The Brazilian Federal Government in its Exclusive Economic Zone (EEZ) created recently these LMPAs.

The Brazilian Federal Government refers to the marine area inside its EEZ as the “Blue Amazon,” since it is rich in biodiversity, natural resources (i.e., carbonate deposits, oil, and gas) and important ecosystem services (i.e., nursery function, protection of shorelines, carbon sink, and fishery resources). This large marine area is similar in extension to Brazil's rainforest [8]. It is possibly one of the most important biodiversity hotspots in the world. However, there is a limited scientific knowledge about its biodiversity, and low awareness about large-scale conservation measures such as the establishment of LMPAs in SPSPA and VTC.

The VTC extends to ca. 1200 km from the Brazilian coast, from the Vitória seamount to the isolated oceanic islands of Trindade and Martin Vaz [9] (Fig. 1). The marine environments found on the VTC are a mosaic of shallow and mesophotic benthic habitats dominated by macroalgae, including crustose coralline algae (CCA) and fleshy algae species on rhodolith beds below 50 m depth [9]. With a total of 211

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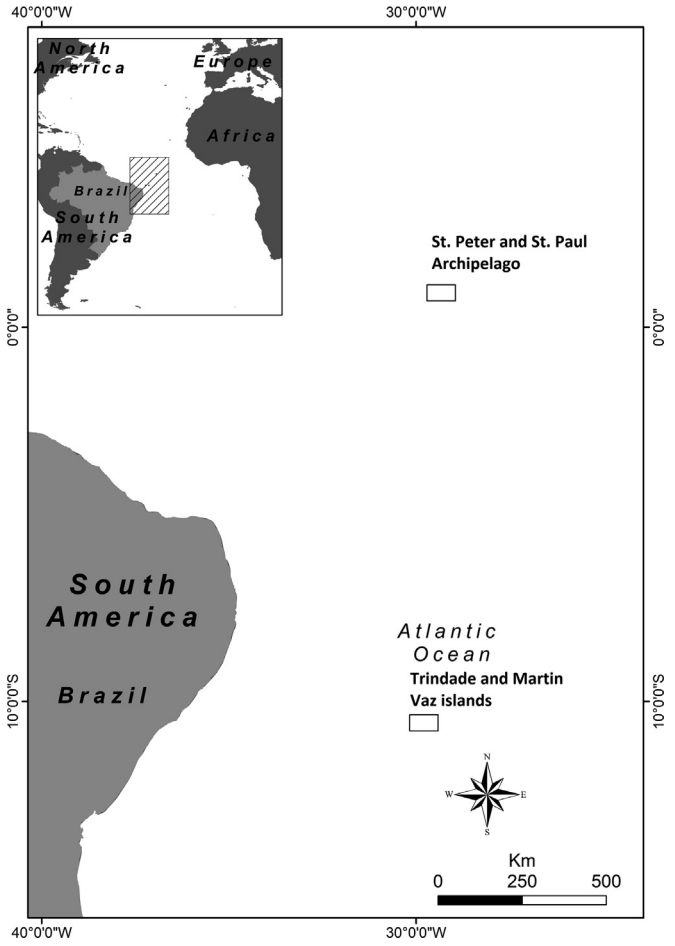

Fig. 1. Remote oceanic islands: St. Peter and St. Paul´s Archipelago and the Trindade and Martin Vaz islands.

species recorded on the seamounts, the reefs shelter a richer and more abundant collection of fauna than the surrounding flat beds, providing a high biological productivity [10]. Moreover, the sparse reef patches provide horizontal connectivity (like stepping stones) between isolated islands and the inner continental shelf and have endemic species [9].

The St. Peter and St. Paul Archipelago (SPSPA) (Fig. 1) consists of the smallest and most isolated tropical islands in the world, creating a unique environment for the development of terrestrial insular and marine biodiversity [11]. This offshore area comprises the most seaward Brazilian oceanic islands (~1000 km from the mainland), and the only Brazilian islands in the northern hemisphere, lying 100 km off the equator [12]. The islands of the SPSPA have a unique geomorphological characteristic, being formed by summits of the Mid-Atlantic Ridge (MAR) within the St Paul Fault Zone (FZ), between the South American and the African Plates [13].

Both oceanic environments (SPSPA and VTC) are situated within the limits of Brazilian national waters. They are considered remote environments, as they lie more than 1000 km off the Brazilian coast and are described as Ecologically or Biologically Significant Areas (EBSAs) according to the Convention on Biological Diversity (CBD). The biological productivity of these environments, their importance for the life-history stages of many species, the presence of endangered, threatened and endemic species, fishery resources, and their unique geological and ecological characteristics support the establishment of LMPAs. Both environments are under threat from human pressure due to overfishing, the possibility of mining activities in the VTC (calcareous nodules) and SPSPA (high-value minerals for industry and technology) [10,11], and disposal of microplastics [14] and other pollutants, as well as climate-change stressors [15].

The Aichi Biodiversity Targets were designed to implement the CBD Strategic Plan by providing a political framework to protect marine biodiversity and ecosystem services, and raise awareness of their benefits for society. For example, Target 11 aims to protect 10% of all seas by 2020 and includes important qualitative qualifiers [5,16]. These international targets provided the political motivation for establishing LMPAs, enabling the Brazilian Government to benefit from several legal mechanisms to strengthen their sovereignty over sea spaces whilst at the same time, including in the management of its EEZ and its natural resources [4,6]. With the creation of these LMPAs, Brazil increases its MPA coverage from 1.5% to ~ 25% of its EEZ. This quantitative protection value (25%) is above the Aichi target. However, even with this high percentage of protection, many important coastal ecosystems (i.e., tropical reefs in the Amazon coast, seamounts in the Brazilian equatorial margin or important coastal urban areas) are not yet protected by MPAs in Brazilian waters [8].

The creation and classification of Brazilian MPAs follows the National Protected Areas System (SNUC in Portuguese). The Conservation Units in this system are a type of PA, and the Brazilian National System divides them into two groups: Strictly Protected Areas (or restricted protection); and Sustainable Use Protected Areas (or direct use). The strictly protected areas are similar to no-take zones. In the standard SNUC, the management categories for MPAs include Natural Monuments (Cat III), and Environmental Protection Areas (Cat V-IUCN) [7].

The participatory creation process conducted by the Brazilian Federal government created these LMPAs in March of 2018. This includes the preservation of natural monuments (islands) and protection of an area of radius 200 nautical miles from the remote SPSPA and VTC. The federal government acts contemplates four MPAs; two for SPSPA and two for VTC (together covering ~920,000 km^2). The Strictly Protected Areas are marine natural monuments that span ~ 69,155 km^2 in VTC and ~ 47,263 km^2 in SPSPA. The Sustainable Use Protected Areas are an Environmental Protection Areas (EPAs) that span 200 nautical miles from the main island in the VTC (402,377 km^2) and SPSPA (407,052 km^2). These PAs created a mosaic of LMPA networks that interact with distinct human uses and degrees of preservation. The proposal was launched and a public participation held in February 2018. In March of 2018, the federal acts (9313/2018 and 9312/2018) were published and created these MPAs. A participatory management plan (for up to 5 years) will have to be developed, which will detail the activities necessary to ensure the social and ecological effectiveness [2] of these LMPAs.

These LMPAs can be an important step towards the conservation of biodiversity and ecosystem services of terrestrial insular, shallow, mesophotic and deep-sea ecosystems [9,12]. Owing to this importance, it is necessary to ensure adequate surveillance, incorporate human dimensions of governance, as well as develop a participatory management plan [2,17] to deal with the increase in human pressures. The main local stressors need to be controlled inside the strictly PA, with the prohibition of mining and fishing. With regard to the EPA (the larger protected area), it is important to promote long-term monitoring, zoning (including no-take zones) and rigorous environmental licensing. Across the entire area, it is important to conduct surveillance of shipping lines to avoid pollution by shipping vessels (including plastics, ballast water discharge, and introduction of exotic species).

The establishment of these LMPAs has greatly enhanced the probability of achieving global protection targets especially for marine ecosystems that occur in the SPSPA and VTC, using large-scale marine spatial planning. LMPAs in these remote areas contain important marine ecosystems (shallow, mesophotic and deep-sea) [9,12] that interact ecologically, and will allow for more holistic conservation in the newest ocean of the planet. These interactions between ecosystems (i.e., vertical connectivity along the depth gradient) can occur without many of the problems associated with networks of smaller MPAs, where the

connectivity between sites is often affected by distinct human activities [2,5].

The disadvantages of these LMPAs include challenges of surveillance, enforcement and monitoring of offshore areas, as well as high total costs for multiple stakeholders involved in the governance [6]. While the cost per unit area may be lower for LMPAs, conducting surveillance and long-term monitoring in such vast areas traditionally requires much more expensive oceanographic technologies [17] but may become more affordable with remote sensing systems. Moreover, questions are raised about the effectiveness, representativeness, and potential for connectivity of these remote LMPAs worldwide [6]. Overcoming capacity shortfalls (human and financial resources) [1,18] and higher levels of participation and enforcement [2] are necessary to improve the management effectiveness of these largest and most recently LMPAs in the South Atlantic Ocean.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.marpol.2018.04.004. These data include Google maps of the most important areas described in this article.

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